

Suggested Language - Motor Specification

1. Rated Horsepower and RPMs Covered

1 to 3hp at 600 rpm	3 to 10hp at 1800 rpm
1 to 5hp at 900 rpm	3 to 15hp at 2400 rpm
1.5 to 7.5hp at 1200 rpm	3 to 20hp at 3600 rpm

2. Classification

- a. Motors shall be of Electronically Commutated Permanent Magnet (ECPM) design and each motor shall be driven by a dedicated Variable Frequency Drive (VFDs).
- b. Variable Frequency Drives (VFD) may be physically integrated with the motor or a separate system component. If the latter, the VFD must be qualified for use with the motor by the motor manufacturer.

3. Energy Efficiency Performance

- a. Motors must be certified by their manufacturer to meet or exceed the following motor-only efficiency minimums at 100% and 50% of their rated speeds. Efficiency measurements are reflective of motors operated by a VFD and in accordance with CSA C838-2013: Energy Efficiency Test Methods for Three-Phase Variable Frequency Drive Systems.

HP	Minimum Efficiency at 100% Rated Speed						Minimum Efficiency at 50% Rated Speed					
	600 rpm	900 rpm	1200 rpm	1800 rpm	2400 rpm	3600 rpm	600rpm	900 rpm	1200 rpm	1800 rpm	2400 rpm	3600 rpm
2	93%	93%	93%	93%	91%		88%	86%	86%	85%	83%	
3	94%	94%	93%	94%	93%	91%	90%	87%	87%	86%	88%	78%
5		94%	94%	94%	94%	93%		88%	89%	86%	90%	83%
7.5			93%	95%	95%	93%			91%	89%	86%	86%
10				95%	95%	94%				91%	89%	88%
15					94%	94%					91%	88%
20						94%						91%

4. VFD Voltage

- a. VFDs shall operate on 3 phase power
- b. VFD voltage must be specified as one of the following:
 - i. 220-240 volts
 - ii. 440-480 volts
 - iii. 550-600 volts

5. Service Factor

- a. Service factor shall be a minimum of 1.15 operating off a VFD.

6. Motor Frame

- a. Motors shall be a NEMA T, NEMA C, or NEMA TC frame
- b. Motors shall comply with NEMA MG 1-4 dimensional requirements

7. Motor Enclosure

- a. Motors shall be of TENV, TEAO, or TEFC type
- b. Motors shall have an ingress protection option of IP54 or greater

8. Motor Bearings

- a. Motor bearings shall be permanently sealed, non-greasable
- b. Motor bearings shall have a minimum 100,000 hour L10 fatigue life for the operating conditions in the table below:

Maximum Shaft Loading for 100,000 Hour L10 Bearing Fatigue Life

		Horizontal Operation		Shaft-Up Operation		Shaft-Down Operation	
Motor Frame	Speed	Shaft Load (lbs)		Shaft Load (lbs)		Shaft Load (lbs)	
NEMA	(RPM)	Radial	Axial	Radial	Axial	Radial	Axial
182T/184T	900	180	180	200	215	150	170
	1800	130	130	150	170	100	120
	3600	90	90	100	130	75	70
213T/215T	900	285	285	300	360	250	260
	1800	215	215	250	275	180	185
	3600	150	150	200	200	110	115

Shaft Loads are combined radial and axial loading. Lower shaft loads will result in longer bearing life.

9. UL Listing

- a. Motors shall be UL Recognized.

10. Motor Grounding

- a. The motor shall be provided with a factory installed shaft grounding apparatus that will protect bearings from damage due to VFD induced shaft currents. Fiber type grounding devices are not permitted
- b. Motors shall be provided with a grounding screw mounted in the conduit box

11. Motor Insulation

- a. The motors shall be manufactured with a Class F insulation system
- b. The motor shall be capable of a Class B temperature rise while operating at the 1.15 service factor

12. Motor Temperature

- a. The motor shall be rated for ambient conditions between -25C and 40C
- b. Motors may operate to 50C ambient with output de-rating

13. Motor Installation

- a. Motors must be installed in accordance with the manufacturer's recommendations and local code requirements

14. Warranty

- a. Motors with nameplate rated speeds up to 2400 rpm in air handling applications must be warranted for repair or replacement by the manufacturer for 7 years